

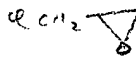
We claim:

*Sub 1*  
1. A recyclable adhesive or coating comprising a polymer which is soluble or dispersible in water, wherein the polymer has 5 to 40 mol % of cationic repeat units, and wherein the adhesive or coating is attracted to fibers during paper recycling.

2. The recyclable adhesive or coating of claim 1, wherein the adhesive is substantially tacky such that it forms a pressure-sensitive adhesive which is capable of bonding to a surface upon contact.

3. The recyclable adhesive or coating of claim 1, wherein the adhesive is a hot-melt adhesive capable of bonding to a surface when heated to above its melting point temperature.

4. The recyclable adhesive or coating of claim 3, wherein the hot melt adhesive is formed by reacting polyamide with epichlorohydrin.



5. The recyclable adhesive or coating of claim 1, wherein the polymer

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FINNEGAN, HENDERSON,  
FARABOW, GARRETT,  
& DUNNER, L.L.P.  
1300 I STREET, N. W.  
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comprises a cationically charged monomer and a backbone co-polymerizable with the cationically charged monomer.

6. The recyclable adhesive or coating of claim 5, wherein the backbone is present in the amount of 60 to 95 mole % based on the polymer.

7. The recyclable adhesive or coating of claim 5, wherein the backbone is present in the amount of 80 to 90 mole % based on the polymer.

8. The recyclable adhesive or coating of claim 5, wherein the cationically charged monomer is present in the amount of 5 to 40 mole % based on the polymer.

9. The recyclable adhesive or coating of claim 5, wherein the cationically charged monomer is present in the amount of 8 to 25 mole % based on the polymer.

10. The recyclable adhesive or coating of claim 5, wherein the backbone is selected from the group consisting of vinyl acetate, butadiene, styrene, acrylate comprising 1 to 8 carbon atoms in the alkyl group, polyacrylate

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& DUNNER, L.L.P.  
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comprising 1 to 8 carbon atoms in the alkyl group, polyester, polyamide, and combinations thereof.

11. The recyclable adhesive or coating of claim 5, wherein the cationically charged monomer is an alkyl ammonium chloride.

12. The recyclable adhesive or coating of claim 5, wherein the cationically charged monomer is selected from the group consisting of {3-(methacryloylammino)- propyl}-trimethyl ammonium chloride, {2-(methacryloyloxy)ethyl}-trimethyl ammonium chloride, diallyldimethylammonium chloride, and vinyl benzyl trimethyl ammonium chloride.

13. The recyclable adhesive or coating of claim 5, wherein the polymer further comprises an internal cross-linker present in the amount of up to 2 mole %, based on the polymer.

14. The recyclable adhesive or coating of claim 5, wherein the polymer further comprises an internal cross-linker present in the amount of 0.1 to 1 mole %, based on the polymer.

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& DUNNER, L.L.P.  
1300 I STREET, N. W.  
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15. The recyclable adhesive or coating of claim 13, wherein the internal cross-linker is selected from the group consisting of ethylene glycol dimethyle, diallyl maleate, diallyl phthalate, divinyl benzene, and poly(ethylene glycol) di(meth)acrylate.

16. The recyclable adhesive or coating of claim 10, wherein the acrylate is an alkyl (meth)acrylate.

17. The recyclable adhesive coating of claim 16, wherein the alkyl(meth)acrylate is select from n-butyl acrylate, 2-ethyl hexyl acrylate, and isooctyl acrylate.

18. The recyclable adhesive or coating of claim 5, wherein the polymer further comprises 0 to 35 mole % based on the polymer of an uncharged water soluble monomer or macromer.

19. The recyclable adhesive or coating of claim 18, wherein the uncharged water soluble monomer or macromer is selected from the group consisting of , dialkylaminoethyl methacrylate, hydroxy alkyl (meth)acrylate, hydroxy alkyl vinyl ether, poly(ethylene glycol) (meth)acrylate, polyethylene

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& DUNNER, L.L.P.  
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glycol, glycerol, diethylenetriamine, polyethyleneimine, and combinations of these compounds.

20. The recyclable adhesive or coating of claim 5, wherein the adhesive further comprises a plasticizer to increase the flexibility of the adhesive.

21. The recyclable adhesive or coating of claim 5, wherein the adhesive further comprises a tackifier to render the adhesive tacky.

22. The recyclable adhesive or coating of claim 1, wherein the adhesive or coating forms a tape.

23. The recyclable adhesive or coating of claim 1, wherein the adhesive or coating forms a label.

24. The recyclable adhesive or coating of claim 1, wherein the adhesive or coating forms a paper coating.

25. The recyclable adhesive or coating of claim 1, wherein the adhesive or coating forms a self-adhesive stamp.

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26. A method for making a recyclable adhesive or coating, comprising:  
combining a cationically charged monomer and a backbone which is co-polymerizable with the cationically charged monomer to form a reaction mixture, wherein the concentrations of the cationically charged monomer and the backbone are pre-selected to control the cationic content of the adhesive; and  
polymerizing the reaction mixture to form an adhesive or coating comprising a polymer which is soluble or dispersible in water, wherein the polymer has 5 to 40 % of cationic repeat units such that the adhesive or coating is attracted to fibers during paper recycling.

27. The method of claim 26, wherein polymerizing the reaction mixture is performed by emulsion polymerization, micro emulsion polymerization, miniemulsion polymerization, solution polymerization, condensation polymerization, or precipitation polymerization.

28. The method of claim 26, wherein polymerizing the reaction mixture comprises heating the reaction mixture to a temperature sufficient to initiate polymerization of the reaction mixture.

29. The method of claim 26, wherein the polymerizing is carried out in

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the presence of an initiator.

30. The method of claim 26, further comprising adding an internal cross-linker to the reaction mixture prior to polymerizing the reaction mixture.

31. The method of claim 26, further comprising adding an uncharged water soluble monomer or macromer having a molecular weight of 350 to 3,000 prior to polymerizing the reaction mixture.

32. The method of claim 26, further comprising adding deionized water to the reaction mixture prior to heating the reaction mixture, wherein heating the reaction mixture results in emulsion polymerization of the reaction mixture.

33. The method of claim 26, further comprising adding an alcohol to the reaction mixture prior to heating the reaction mixture, wherein heating the reaction mixture results in solution polymerization of the reaction mixture.

34. The method of claim 26, wherein the adhesive is substantially tacky such that it forms a pressure-sensitive adhesive which is capable of bonding to a surface upon contact.

35. The method of claim 26, further comprising combining a tackifier with the polymer to render the adhesive substantially tacky.

36. The method of claim 26, further comprising combining a plasticizer with the polymer for increasing the flexibility of the adhesive or coating.

37. The method of claim 26, wherein the polymer formed comprises 60 to 95 mole % of the backbone, wherein the backbone is selected from the group consisting of vinyl acetate, butadiene, styrene, acrylate comprising 1 to 8 carbon atoms in the alkyl group, and combinations of these compounds.

38. The method of claim 27, wherein the polymer formed comprises 75 to 85 mole % of the backbone, wherein the backbone is selected from the group consisting of vinyl acetate, butadiene, styrene, acrylate comprising 1 to 8 carbon atoms in the alkyl group, and combinations of these compounds.

39. The method of claim 37, wherein the backbone is an acrylate selected from the group consisting of n-butyl acrylate, 2-ethyl hexyl acrylate, and isooctyl acrylate.



40. The method of claim 26, wherein the polymer formed comprises 5 to 40 mole % of the cationically charged monomer, the cationically charged monomer being selected from the group consisting of {3-methacryloylammino)propyl} trimethyl-ammonium chloride, {2-(methacryloyloxy) ethyl} trimethyl ammonium chloride, diallyldimethylammonium chloride, and vinyl benzyl trimethyl ammonium chloride.

41. The method of claim 26, wherein the polymer formed comprises 10 to 25 mole % of the cationically charged monomer, the cationically charged monomer being selected from the group consisting of {3-methacryloylammino)propyl} trimethyl-ammonium chloride, {2-(methacryloyloxy) ethyl} trimethyl ammonium chloride, diallyldimethylammonium chloride, cetyl ammonium bromide, and the reaction product of epichlorohydrin and trialkylamine or an amide.

42. The method of claim 30, wherein the polymer formed comprises 0 to 2 mole %, preferably 0.1 to 1 mole %, of the internal cross-linker being selected from the group consisting of ethylene glycol dimethylate, diallyl maleate, diallyl phthalate, divinyl benzene, and poly(ethylene glycol) di(meth)acrylate.

43. The method of claim 31, wherein the polymer formed comprises 0 to 35 mole % of the uncharged water soluble monomer or macromer.

44. The method of claim 43, wherein the uncharged water soluble monomer or macromer is selected from the group consisting of ,  
dialkylaminoethyl methacrylate, hydroxy alkyl (meth)acrylate, hydroxy alkyl vinyl ether, poly(ethylene glycol) (meth)acrylate, polyethylene glycol, glycerol, diethylenetriamine, polyethyleneimine, and combinations thereof.

~~45~~. A method for recycling a paper product and a recyclable adhesive or coating, comprising repulping the paper product by placing the paper product and the adhesive or coating in water to form a pulp slurry having adhesive particles dissolved or dispersed in the water, wherein the polymer comprises a polymer having 5 to 40 % of cationic repeat units such that the adhesive or coating is attracted to fibers in the pulp slurry.

46. The method of claim 45, further comprising cleaning and screening the repulped paper product to remove contaminants.

47. The method of claim 45, wherein the adhesive is substantially tacky

such that it forms a pressure-sensitive adhesive which is capable of bonding to a surface upon contact.

48. The method of claim 45, wherein the adhesive forms a hot-melt adhesive capable of bonding to a surface when heated to above its melting point temperature.

49. The method of claim 45, wherein the polymer comprises a cationically charged monomer and a backbone co-polymerizable with the cationically charged monomer.

50. The method of claim 49, wherein the backbone is present in the amount of 60 to 95 mole % based on the polymer.

51. The method of claim 49, wherein the backbone is present in the amount of 75 to 85 mole % based on the polymer.

52. The method of claim 49, wherein the cationically charged monomer is present in the amount of 10 to 25 mole % based on the polymer.

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& DUNNER, L.L.P.  
1300 I STREET, N.W.  
WASHINGTON, D.C. 20005  
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53. The method of claim 49, wherein the backbone is selected from the group consisting of vinyl acetate, butadiene, styrene, acrylate comprising 1 to 8 carbon atoms in the alkyl group, and combinations of these compounds.

54. The method of claim 49, wherein the cationically charged monomer is selected from the group consisting of {3-(methacryloylammino)propyl}-trimethyl ammonium chloride, {2-(methacryloyloxy)- ethyl} trimethyl ammonium chloride, diallyldimethylammonium chloride, and vinyl benzyl trimethyl ammonium chloride.

55. The method of claim 49, wherein the polymer further comprises an internal cross-linker present in the amount of up to 2 mole % based on the polymer.

56. The method of claim 49, wherein the polymer further comprises an internal cross-linker present in the amount of 0.1 to 1 mole % based on the polymer.

57. The method of claim 55, wherein the internal cross-linker is selected from the group consisting of ethylene glycol dimethylate, diallyl maleate,

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300  
200  
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diallyl phthalate, divinyl benzene, and poly(ethylene glycol) di(meth)acrylate.

58. The method of claim 53, wherein the back bone is an acrylate selected from the group consisting of alkyl (meth)acrylate, n-butyl acrylate, 2-ethyl hexyl acrylate, and isooctyl acrylate.

59. The method of claim 49, wherein the polymer further comprises 0 to 35 mole % based on the polymer of an uncharged water soluble monomer or macromer.

60. The method of claim 59, wherein the uncharged water soluble monomer or macromer is selected from the group consisting of , dialkylaminoethyl methacrylate, hydroxy alkyl (meth)acrylate, hydroxy alkyl vinyl ether, poly(ethylene glycol) (meth)acrylate, polyethylene glycol, glycerol, diethylenetriamine, polyethyleneimine, and combinations of these compounds.

61. The method of claim 49, wherein the adhesive or coating further comprises a plasticizer to increase the flexibility of the adhesive.

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62. The method of claim 49, wherein the adhesive further comprises a tackifier to make the adhesive more tacky.

63. A recyclable adhesive tape made according to the method of claim 26.

64. A recyclable adhesive label made according to the method of claim 26.

65. A recyclable self-adhesive stamp made according to the method of claim 26.

*See*  
*Ar*  
66. A recyclable paper coating made according to the method of claim 26.

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